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JUL 10 1998

Federal Communications Commission
Office of Secretary

ORIGINAL

July 10, 1998

NORTEL
NORTHERN TELECOM

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, NW – Room 222
Washington, DC 20554

**Re: Ex Parte File, WT Docket No. 96-86**

Dear Ms. Salas:

On behalf of Nortel (Northern Telecom) and pursuant to the FCC's rules, enclosed please find an original and two copies of a written ex parte submission related to the subject matter of the referenced proceeding. This written submission has also been provided by hand delivery today to the Chairman and each of the Commissioners as well as the Chief of the Wireless Bureau and John Clark of the Wireless Bureau.

Please call me if you have any questions.

Sincerely,

Raymond L. Strassburger
Director, Government Relations
Telecommunications Policy

Enclosure

cc: Chairman William Kennard, Commissioner Susan Ness, Commissioner Harold Furchtgott-Roth, Commissioner Michael Powell, Commissioner Gloria Tristani, Dan Phythyon, John Clark

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JUL 10 1998

Federal Communications Commission
Office of Secretary

Before the
Federal Communications Commission
Washington, D.C. 20554

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|---|---|---|
| In the Matter of | ) | |
| | ) | |
| The Development of Operational, | ) | |
| Technical, and Spectrum Requirements | ) | |
| For Meeting Federal, State and Local | ) | WT Docket No. 96-86 |
| Public Safety Agency Communication | ) | |
| Requirements Through the Year 2010 | ) | |
| | ) | |
| Establishment of Rules and Requirements | ) | |
| For Priority Access Service | ) | |

# Ex Parte Submission of Northern Telecom Inc.

## Introduction

Northern Telecom Inc. (Nortel) submits this ex-parte filing to urge adoption of rules which promote spectrum efficiency and competition in public safety communications. In particular, Nortel agrees with Motorola that adjacent channel power requirements not be unduly stringent.[1] Such requirements can limit spectrum efficiency and increase the cost of spectrum efficient solutions with the consequent negative impact upon public safety communications equipment users. Nortel agrees with the statement of Motorola that efficient allocation of spectrum does not require coupled power to be small.[2] More specifically, Nortel agrees with the statements about the drawbacks of the previous measurement method of peak hold measurement.[3] Nevertheless, as

[1] Sections 2.4 and 3.2 of Appendix to the Motorola comments to the Second NPRM entitled "Tehnical Recommendations for the 756-806 MHz Public Safety band" ("the Appendix").
[2] Sections 2.2 and 3.1 of the Appendix, pg. 7 and 17.
[3] Sections 2.4 and 3.2 of Appendix.

demonstrated by Ericsson, the value of -40 dBc over the first adjacent 6.25 kHz band is overly stringent.[4]

Nortel, therefore, submits this filing in specific response to sections 2.4 and 3.2 of the Appendix . Nortel contends that average measurement method or retention of the existing Part 90 measurement method are more appropriate approaches for measurement methods or specifications. Nortel believes that these alternative proposals are consistent with the goals of the rulemaking and will lead to lower public safety equipment costs through more simple product design and will not preclude the entry or participation of potential public safety equipment.

Adoption of the Motorola proposal could render existing compliant equipment non-compliant. Ericsson emphasizes that it would have to redesign its linearized power amplifiers. The Ericsson statements illuminate the technical challenge of meeting the Motorola proposed requirements which likely will lead to increased costs and reduced competition – both results contrary to the stated goals of the Commission in this rulemaking.

**Discussion**

1. Peak hold measurement using a spectrum analyser of a signal subject to additive white noise with unbounded gaussian behaviour is, by nature, an intrinsically random process. Today, manufacturers must accommodate the random results of the peak hold measurement method by designing for the worst case which the peak hold measurement might yield, and thereby limit the probability of a negative measurement. This overdesign

[4] Ericsson ex parte filing dated April 30, 1998, filed May 1. 1998

has a cost for the manufacturer and thus for the end-user, without benefit for the user which knows only the worst case but not the average margin provided by the equipment.

2. Such random and inconsistent results can be avoided through the use of average measurement rather than peak hold measurement. With adoption of the average measurement method, possibly combined with a greater degree of severity, users realize a real benefit rather than just protection against random behaviour of the peak hold measurement process.

3. Motorola's proposed method of measurement uses a power measurement in the full bandwidth of a 6.25 kHz receiver adjacent to the channel under measurement. This method does not take into account the actual behaviour of a 6.25 kHz receiver, is too sensitive to frequency accuracy and is unduly severe as FCC Part 90 compliant transmitters may be rejected under this proposed criteria. Ericsson reaches the same conclusion in its filing.

4. The actual receivers using a 6.25 kHz channel are equipped with a channel filter whose bandwidth is significantly lower than the full channel bandwidth of 6.25 kHz. This channel filter can be a simple channel filter, but is more likely to be the combination of an IF channel filter and digital adapted filtering. Extensive studies made by the European Telecommunications Standards Institute (ETSI) for narrowband systems have demonstrated than an average value of the filter width equal to .70 to .80 of the channel spacing represents a reasonable design.

5.0 With Motorola's proposed method that corresponds to a flat filter of bandwidth equal to the full channel width, the edge of the filter is just within the slope of the spectra of the transmitted signal. This is especially true for 12.5 kHz signals which make more efficient use of the allocated bandwidth. So, a small variation of frequency between the transmitter and the measurement device can adversely impact the reading. Thus, the proposed method does not have the required stability.

5.1 As defined by the figure provided by Motorola, the transmit spectrum of a spectrally efficient digital transmitter must have a very high slope. Therefore, performance can be adversely affected by a small frequency shift. Smaller slope, like the one specified in the masks of Part 90, offers better confidence for the users, as the relationship between frequency accuracy and performance does not have such a sharp knee.

5.2 Therefore, Nortel recommends a power measurement done with a flat filter of width equal to 0.8 of the channel width. For example for a 6.25 kHz transmitter, a flat filter of 5 kHz bandwidth, centered within the adjacent channel would be used. For a 12.5 kHz transmitter, measurement would be done through a flat filter between 9.375-2.5 = 6.875 kHz and 9.375 + 2.5 = 11.875 kHz of the center of measured transmitter spectra.

6. Even with the above proposed reduction of the filter bandwidth, the -40 dBc proposed by Motorola in section 2.4 and 3.2 conflicts with the statement that the coupled power does not need to be small. The –40 dBc is significantly more stringent than the current requirements of FCC Part 90. For a 12.5 kHz transmitter, the spectral density according to mask D of FCC Part 90 at 6.875 of the channel center is to be lower than 7.27*(6.875 - 2.88) = -29 dBc. According to Part 90, this power accounts for the first 100 Hz in the filter bandwidth and the power in the full bandwidth is about 8 dB higher (see Attachment B). This -21 dBc figure required for compatibility with FCC Part 90 compliant transmitters has to be corrected for the overestimate due to change in the

measurement settings (peak hold to average) and according to usual figures a 4 dB strengthening, making -25 dBc figure a reasonable estimate. Although this figure is significantly lower than the Motorola proposed -40 dBc, it is consistent with a co-channel interference protection of about 17-20 dB, which is likely to be achieved by spectrum efficient digital transmission. With a safe reuse pattern of at least twelve, adjacent channels could be allocated in non-adjacent cells and thus, the -25 dBc figure for adjacent channel protection is significantly less stringent for frequency allocation policy than the co-channel interference protection figure.The –25 dBc figure is also consistent with the mutual aid channels allocation suggested by Motorola, with which Nortel agrees.

## Conclusions

Nortel recommends approval of Motorola specifications, except for sections 2.4 and 3.2 of the Appendix. Nortel proposes the specific changes set forth in Attachment A for Section 2.4 of the Appendix. Similar modifications should be made with regard to Section 3.2 of the Appendix. Nortel recommends either an average measurement with a spectrum analyser or, as an alternative, Nortel recommends that the FCC retain the existing Part 90 requirements, as proposed by NPSTC.

**Attachment A**

2.4.1 Mobile station transmitter requirements

**6.25 kHz Mobile station transmitter requirements**

| Frequency offset from channel center frequency | Measurement bandwidth | Maximum coupled power at maximum Tx power | Maximum coupled power under maximum power reduction |
|---|---|---|---|
| 6.25 kHz | 5 kHz | -25 dBc | - |
| 12.5 | 5 | -60 | -45 dBm |
| 18.75 | 5 | -60 | -45 |
| 25 | 5 | -65 | -50 |
| 37.5 | 25 | -65 | -50 |
| 62.5 | 25 | -65 | -50 |
| 87.5 | 25 | -65 | -50 |
| 150 | 100 | -65 | -50 |
| 250 | 100 | -65 | -50 |
| > 400 to receive band | 30 kHz * | -75 | -55 |
| In the receive band | 30 kHz * | -100 | -70 |

* Swept measurement - see section 2.4.3

**12.5 kHz Mobile station transmitter requirements**

| Frequency offset from channel center frequency | Measurement bandwidth | Maximum coupled power at maximum Tx power | Maximum coupled power under maximum power reduction |
|---|---|---|---|
| 9.375 kHz | 5 kHz | -25 dBc | - |
| 15.625 | 5 | -60 | -45 dBm |
| 21.875 | 5 | -60 | -45 |
| 37.5 | 25 | -65 | -50 |
| 62.5 | 25 | -65 | -50 |
| 87.5 | 25 | -65 | -50 |
| 150 | 100 | -65 | -50 |

| | | | |
|---|---|---|---|
| 250 | 100 | -65 | -50 |
| > 400 to receive band | 30 kHz * | -75 | -55 |
| In the receive band | 30 kHz * | -100 | -70 |

* Swept measurement - see section 2.4.3

**25 kHz Mobile station transmitter requirements**

| Frequency offset from channel center frequency | Measurement bandwidth | Maximum coupled power at maximum Tx power | Maximum coupled power under maximum power reduction |
|---|---|---|---|
| 15.625 | 5 | -25 dBc | - |
| 21.875 | 5 | -60 | -45 dBm |
| 37.5 | 25 | -65 | -50 |
| 62.5 | 25 | -65 | -50 |
| 87.5 | 25 | -65 | -50 |
| 150 | 100 | -65 | -50 |
| 250 | 100 | -65 | -50 |
| > 400 to receive band | 30 kHz * | -75 | -55 |
| In the receive band | 30 kHz * | -100 | -70 |

* Swept measurement - see section 2.4.3

2.4.2 Fixed station transmitter requirements

**6.25 kHz Fixed station transmitter requirements**

| Frequency offset from channel center frequency | Measurement bandwidth | Maximum coupled power at maximum Tx power |
|---|---|---|
| 6.25 kHz | 5 kHz | -25 dBc |
| 12.5 | 5 | -60 |
| 18.75 | 5 | -60 |
| 25 | 5 | -65 |
| 37.5 | 25 | -65 |
| 62.5 | 25 | -65 |
| 87.5 | 25 | -65 |
| 150 | 100 | -65 |
| 250 | 100 | -65 |
| > 400 to receive band | 30 kHz * | -80 |
| In the receive band | 30 kHz * | -100 |

* Swept measurement - see section 2.4.3

**12.5 kHz Mobile station transmitter requirements**

| Frequency offset from channel center frequency | Measurement bandwidth | Maximum coupled power at maximum Tx power |
|---|---|---|
| 9.375 kHz | 5 kHz | -25 dBc |
| 15.625 | 5 | -60 |
| 21.675 | 5 | -60 |
| 37.5 | 25 | -65 |
| 62.5 | 25 | -65 |
| 87.5 | 25 | -65 |
| 150 | 100 | -65 |
| 250 | 100 | -65 |
| > 400 to receive band | 30 kHz * | -80 |
| In the receive band | 30 kHz * | -100 |

* Swept measurement - see section 2.4.3

**25 kHz Mobile station transmitter requirements**

| Frequency offset from channel center frequency | Measurement bandwidth | Maximum coupled power at maximum Tx power |
|---|---|---|
| 15.625 | 5 | -25 dBc |
| 21.675 | 5 | -60 |
| 37.5 | 25 | -65 |
| 62.5 | 25 | -65 |
| 87.5 | 25 | -65 |
| 150 | 100 | -65 |
| 250 | 100 | -65 |
| > 400 to receive band | 30 kHz * | -80 |
| In the receive band | 30 kHz * | -100 |

* Swept measurement - see section 2.4.3

2.4.3 Detailed Measurement Procedure

[Note : « measurement bandwidth » used below implies an instrument that measures the power in many narrow bandwidth (e.g. 300 Hz) and integrates these powers across a larger bandwidth to determine power in the measurement bandwidth.]

Nortel proposes that the following procedure be used in making transmitter measurements. For TDMA systems, the measurement is to be made under TDMA operation only during time slots when the transmitter is on (see note). All measurements are to be made at the input of transmitter's antenna.

**Coupled power measurements**

*Setting reference level*: Using a spectrum analyser capable of adjacent channel power measurements, set the measurement bandwidth to the channel bandwidth. In other words, for a 6.25 kHz transmitter, set the measurement bandwidth to 6.25 kHz ; for a 12.5 kHz transmitter, set the measurement bandwidth to 12.5 kHz, etc. Set the frequency offset of the measurement bandwidth to 0 Hz and adjust the center frequency of the spectrum analyser to give the power level in the measurement bandwidth. Record this power level in dBm as the « reference power level ».

*Measuring the power level at frequency offsets lower than 400 kHz* : Using a spectrum analyser capable of adjacent channel power measurements, set the measurement bandwidth as shown in the tables above. Measure the power in dBm in average mode. This measurement should be made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power measured in the previous step. The coupled power values must be less than the values given in the table for each condition above (see Note).

*Measuring the power level at frequency offsets higher than 400 kHz* : Set the spectrum analyser to 30 kHz resolution bandwidth, 1 Mhz video bandwidth. and average mode. Sweep +/- 6 Mhz from the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the absolute power. The response at frequencies greater than 400 kHz must be at least -75 dBc (-80 dBc for fixed stations) with respect to the on-channel response.

Upper power limit measurement : The absolute coupled power in dBm measured above should be compared to the table entry for each given frequency offset. For those mobile stations with power control, the above measurement should be repeated with power control set to maximum reduction. The absolute coupled power at maximum power reduction must be less than the table entry.

Note : 1. For TDMA measurements, as average mode is chosen, whole slot, including switching transients, should be taken into account for above measurements.

2. As the measurement filter is smaller than the reference points spacing, full spectrum is not tested. Intermediate points should be less than corresponding interpolation points.

## Attachment B

**Power in adjacent channel for a Part 90 Mask D compliant transmitter**

As stated in Part 90 Mask D, the power in a 100 Hz bandwidth is attenuated compared to the transmit power of the device under test by an attenuation factor equal to :

A = 7.27 * (f - 2.88), f in kHz

Therefore, the power in the first 100 Hz starting at 6.875 kHz offset is equal to transmit power multiplied by an attenuation factor :

A0= -7.27*(6.875 - 2.88) = -29.04 dB

For each successive 100 Hz bandwidth, the power is further attenuated by 0.727 dB, i.e. r = 0.8459. The power in the measurement band is thus equal to the power in the first 100 Hz multiplied by :

$$1 + r + r^2 + r^3 + \cdots \approx \frac{1}{1-r} \approx 6.48$$

i.e. 8.12 dB.

The attenuation factor in the measurement band is:

-29.04 + 8.12

i.e. about -21 dB.